

IN THE  
UNITED STATES PATENT AND TRADEMARK OFFICE

Inv ntor(s): Peter G. Webb et al.

Serial No.: 09/359,527

Filing Date: 07/22/1999

Title: BIOPOLYMER ARRAYS AND THEIR FABRICATION

Examiner: Ardin H. Marschel

Group Art Unit: 1631

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COMMISSIONER FOR PATENTS  
Washington, D.C. 20231

TRANSMITTAL LETTER FOR RESPONSE/AMENDMENT

Sir:

Transmitted herewith is/are the following in the above-identified application:

- (X) Response/Amendment ( ) Petition to extend time to respond  
( ) New fee as calculated below ( ) Supplemental Declaration  
( ) No additional fee (Address envelope to "Box Non-Fee Amendments")  
( ) Other: \_\_\_\_\_ (fee \$ \_\_\_\_\_)

CLAIMS AS AMENDED BY OTHER THAN A SMALL ENTITY						
(1) FOR	(2) CLAIMS REMAINING AFTER AMENDMENT	(3) NUMBER EXTRA	(4) HIGHEST NUMBER PREVIOUSLY PAID FOR	(5) PRESENT EXTRA	(6) RATE	(7) ADDITIONAL FEES
TOTAL CLAIMS	20	MINUS	45	= 0	X \$18	\$ 0
INDEP. CLAIMS	8	MINUS	8	= 0	X \$84	\$ 0
[ ] FIRST PRESENTATION OF A MULTIPLE DEPENDENT CLAIM					+ \$280	\$ 0
EXTENSION FEE	1ST MONTH \$110.00	2ND MONTH \$400.00	3RD MONTH \$920.00	4TH MONTH \$1440.00		\$ 0
OTHER FEES						\$
TOTAL ADDITIONAL FEE FOR THIS AMENDMENT						\$ 0

Charge \$ 0 to Deposit Account 50-1078. At any time during the pendency of this application, please charge any fees required or credit any overpayment to Deposit Account 50-1078 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 50-1078 under 37 CFR 1.16, 1.17, 1.19, 1.20 and 1.21. A duplicate copy of this sheet is enclosed.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, Washington, D.C. 20231.

Date of Deposit: Nov. 27, 2002

Typed Name: Elizabeth Miller

Signature: Elizabeth Miller

Respectfully submitted,

Peter G. Webb et al.

By

Gordon M. Stewart

Attorney/Agent for Applicant(s)  
Reg. No. 30,528

Date: Nov. 27, 2002



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Elizabeth Miller  
Elizabeth Miller

11/27/02  
Date

ATTORNEY DOCKET NO. 10990641-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Peter G. Webb *et al.*

Group Art Unit: 1631

Serial No.: 09/359,527

Examiner: Arden Marschel

Filed: 07/22/99

Title: BIOPOLYMER ARRAYS AND THEIR FABRICATION

Commissioner for Patents  
Washington, D.C. 20231

Dear Sir:

AMENDMENT AND RESPONSE

Please amend the present application by canceling claims 1, 7, 15, 16, 18, 19, 46-48 and amending other of the claims as indicated in the attached APPENDIX. In accordance with 37 CFR 1.121(c)(3) a clean copy of all of the claims as now pending is below:

2. (TWICE AMENDED) A method according to claim 1~~0~~, additionally comprising operating the deposition apparatus according to the actual drive pattern.
3. A method according to claim 10 wherein the probes are DNA or RNA probes.
4. A method according to claim 10 additionally comprising saving the target drive pattern in a memory of the deposition apparatus.

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5. (TWICE AMENDED) A method according to claim 1<sup>1</sup> additionally comprising saving the target drive pattern in a memory of the deposition apparatus, and wherein the actual drive pattern is saved in the memory.

6. (TWICE AMENDED) A method according to claim 1<sup>1</sup> wherein the actual drive pattern is derived without obtaining a target drive pattern.

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8. (THREE TIMES AMENDED) A method of fabricating an addressable array of biopolymer probes on a substrate according to a target array pattern using a deposition apparatus which, when operated according to a target drive pattern based on nominal operating parameters of the apparatus, provides the probes on the substrate in the target array pattern, the method comprising:

- (a) examining at least one operating parameter for an error from a nominal value which error will result in use of the target drive pattern producing a discrepancy between the target array pattern and an actual array pattern deposited;
- (b) when an error is detected deriving, based on the error, an actual drive pattern different from the target drive pattern such that use of the actual drive pattern results in a reduced discrepancy between the target and actual array patterns; and
- (c) operating the deposition apparatus according to the actual drive pattern so as to fabricate the array;

wherein:

the deposition apparatus includes a dispensing head to dispense fluid droplets containing the probes or probe precursors, and a transport system to move at least one of the dispensing head and substrate relative to the other as the droplets are dispensed from the head, so as to form the array;

the target drive pattern controls operation of the transport system; and

the operating parameter is the position of the dispensing head, which is examined by viewing the dispensing head.

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9. A method according to claim 8 wherein the operating parameter is examined by viewing a fiducial mark on the dispensing head.

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10. (TWICE AMENDED) A method of fabricating an addressable array of biopolymer probes on a substrate according to a target array pattern using a deposition apparatus which, when operated according to a target drive pattern based on nominal operating parameters of the apparatus, provides the probes on the substrate in the target array pattern, the method comprising:

- (a) examining at least one operating parameter for an error from a nominal value which error will result in use of the target drive pattern producing a discrepancy between the target array pattern and an actual array pattern deposited;
- (b) when an error is detected deriving, based on the error, an actual drive pattern different from the target drive pattern such that use of the actual drive pattern results in a reduced discrepancy between the target and actual array patterns; and
- (c) operating the deposition apparatus according to the actual drive pattern so as to fabricate the array;

wherein:

the deposition apparatus includes a dispensing head with multiple nozzles to dispense fluid droplets containing the probes or probe precursors, and a transport system to move at least one of the dispensing head and substrate relative to the other as the droplets are dispensed from the head, so as to form the array;

the drive pattern controls operation of the transport system;

the at least one operating parameter is the position of the substrate or dispensing head, or orientation of a nozzle, and is examined by viewing the dispensing head, or nozzle, or a droplet pattern previously dispensed from the head.

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11. (TWICE AMENDED) A method according to claim 4 additionally comprising saving the target drive pattern in a memory of the deposition apparatus, and wherein the actual drive pattern is saved in the memory, prior to operating the dispensing head and transport system to form the array.

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12. (TWICE AMENDED) A method according to claim 4 additionally comprising saving the target drive pattern in a memory of the deposition apparatus, and wherein the actual drive pattern is derived by modifying, based on the detected error, instructions to at least one deposition apparatus component based on the target

drive pattern during operation of the dispensing head and transport system to form the array.

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13. (TWICE AMENDED) A method according to claim 10 wherein the at least one operating parameter is examined by viewing the droplet pattern previously dispensed from the head.

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14. A method according to claim 10 wherein the at least one operating parameter is a position of the dispensing head.

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17. (TWICE AMENDED) A method of fabricating an addressable array of biopolymer probes on a substrate according to a target array pattern using a deposition apparatus which, when operated according to a target drive pattern based on nominal operating parameters of the apparatus, provides the probes on the substrate in the target array pattern, the method comprising:

- (a) examining at least one operating parameter for an error from a nominal value which error will result in use of the target drive pattern producing a discrepancy between the target array pattern and an actual array pattern deposited;
- (b) when an error is detected deriving, based on the error, an actual drive pattern different from the target drive pattern such that use of the actual drive pattern results in a reduced discrepancy between the target and actual array patterns; and
- (c) operating the deposition apparatus according to the actual drive pattern so as to fabricate the array;

wherein:

the deposition apparatus includes a dispensing head with multiple nozzles to dispense fluid droplets containing the probes or probe precursors, and a transport system to move at least one of the dispensing head and substrate relative to the other as the droplets are dispensed from the head, so as to form the array;

the drive pattern controls operation of the transport system;

and wherein the at least one parameter is a position of a nozzle which is examined by viewing the nozzle, or a droplet pattern previously dispensed from the head.

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(TWICE AMENDED) A method of fabricating an addressable array of biopolymer probes on a substrate according to a target array pattern using a deposition apparatus which, when operated according to a target drive pattern based on nominal operating parameters of the apparatus, provides the probes on the substrate in the target array pattern, the method comprising:

- (a) examining at least one operating parameter for an error from a nominal value which error will result in use of the target drive pattern producing a discrepancy between the target array pattern and an actual array pattern deposited;
- (b) when an error is detected deriving, based on the error, an actual drive pattern different from the target drive pattern such that use of the actual drive pattern results in a reduced discrepancy between the target and actual array patterns; and
- (c) operating the deposition apparatus according to the actual drive pattern so as to fabricate the array;

wherein the operating parameter is a fluid volume dispensed by the deposition apparatus.

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(TWICE AMENDED) A method of fabricating an addressable array of biopolymer probes on a substrate according to a target array pattern using a deposition apparatus which, when operated according to a target drive pattern based on nominal operating parameters of the apparatus, provides the probes on the substrate in the target array pattern, the method comprising:

- (a) examining at least one operating parameter for an error from a nominal value which error will result in use of the target drive pattern producing a discrepancy between the target array pattern and an actual array pattern deposited;
- (b) when an error is detected deriving, based on the error, an actual drive pattern different from the target drive pattern such that use of the actual drive pattern results in a reduced discrepancy between the target and actual array patterns; and
- (c) operating the deposition apparatus according to the actual drive pattern so as to fabricate the array;

wherein the operating parameter is a position of a component which varies due to thermal expansion.

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~~51.~~ (TWICE AMENDED) A method of fabricating an addressable array of biopolymer probes on a substrate according to a target array pattern using a deposition apparatus which, when operated according to a target drive pattern based on nominal operating parameters of the apparatus, provides the probes on the substrate in the target array pattern, the method comprising:

- (a) examining at least one operating parameter for an error from a nominal value which error will result in use of the target drive pattern producing a discrepancy between the target array pattern and an actual array pattern deposited;
- (b) when an error is detected deriving, based on the error, an actual drive pattern different from the target drive pattern such that use of the actual drive pattern results in a reduced discrepancy between the target and actual array patterns; and
- (c) operating the deposition apparatus according to the actual drive pattern so as to fabricate the array;

wherein:

the deposition apparatus includes a dispensing head to dispense fluid droplets containing the probes or probe precursors, and a transport system to move at least one of the dispensing head and substrate relative to the other as the droplets are dispensed from the head, so as to form the array;

the apparatus further includes an encoder to provide data on the location of the substrate or head; and

the at least one operating parameter is an encoder error.

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~~52.~~ (TWICE AMENDED) A method of fabricating an addressable array of biopolymer probes on a substrate according to a target array pattern using a deposition apparatus which, when operated according to a target drive pattern based on nominal operating parameters of the apparatus, provides the probes on the substrate in the target array pattern, the method comprising:

- (a) examining at least one operating parameter for an error from a nominal value which error will result in use of the target drive pattern producing a discrepancy between the target array pattern and an actual array pattern deposited;

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- (b) when an error is detected deriving, based on the error, an actual drive pattern different from the target drive pattern such that use of the actual drive pattern results in a reduced discrepancy between the target and actual array patterns; and
- (c) operating the deposition apparatus according to the actual drive pattern so as to fabricate the array;

wherein:

the deposition apparatus includes a dispensing head with multiple nozzles to dispense fluid droplets containing the probes or probe precursors, and a transport system to move at least one of the dispensing head and substrate relative to the other as the droplets are dispensed from the head, so as to form the array;

the drive pattern controls operation of the transport system;

the operating parameter is the position of the dispensing head, or orientation of a nozzle, and is examined by viewing the dispensing head, or nozzle.

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~~55.~~ (AMENDED) A method according to claim <sup>15</sup>~~49~~ wherein the deposition apparatus comprises multiple jets for dispensing droplets, and wherein the actual drive pattern comprises an instruction to switch to a different jet when a deviation from nominal volume is encountered for one jet which is more than a predetermined tolerance.

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~~56.~~ (TWICE AMENDED) A method of fabricating an addressable array of biopolymer probes on a substrate according to a target array pattern using a deposition apparatus which, when operated according to a target drive pattern based on nominal operating parameters of the apparatus, provides the probes on the substrate in the target array pattern, the method comprising:

- (a) examining at least one operating parameter for an error from a nominal value which error will result in use of the target drive pattern producing a discrepancy between the target array pattern and an actual array pattern deposited;
- (b) when an error is detected deriving, based on the error, an actual drive pattern different from the target drive pattern such that use of the actual drive pattern results in a reduced discrepancy between the target and actual array patterns; and



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(c) operating the deposition apparatus according to the actual drive pattern so as to fabricate the array;

wherein the same error affects less than all of the array features.

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57. A method according to claim 10 wherein the same error affects less than all of the array features.